Assessing the contributions of cognitive-behavioral and ACT constructs in the prediction of health anxiety

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Abstract

Cognitive-behavioral models of health anxiety (HA), although widely-accepted, do not entirely explain the variability in HA symptoms. Constructs derived from Relational Frame Theory (RFT) and Acceptance and Commitment Therapy (ACT) may improve our understanding of HA above and beyond cognitive-behavioral constructs. The current study investigates the degree to which RFT constructs [e.g., cognitive fusion and experiential avoidance (EA)] predict HA and whether or not they explain unique variability in HA symptoms above and beyond cognitive-behavioral constructs. Participants (N=265) completed online self-report measures of HA, dysfunctional health-related cognitions, EA, cognitive fusion, and general distress. To examine the extent to which RFT constructs predicted HA symptoms after controlling for general distress and health-related cognitions, a hierarchical regression analysis that included general distress in step 1, health-related cognitions in step 2, and RFT constructs in step 3 was conducted. Bivariate correlation analyses revealed that all cognitive-behavioral and RFT constructs were associated with HA symptoms (*rs* ranging from 0.17 to 0.49, *p*s < .01). Analyses revealed that a) the overall regression model accounted for 41.9% of the variance in HA symptoms [$F(9,264) = 22.18$, $p < .001$], and b) RFT constructs, taken together explained unique variance above and beyond cognitive behavioral constructs in the prediction of HA symptoms ($\Delta R^2 = .02$, $F(2,255) = 4.27$, $p = .02$). Results support the notion that RFT offers explanatory power in understanding HA symptoms. Findings have implications for including acceptance-based strategies in the treatment of HA. Study limitations and future directions will be discussed.

Assessing the contributions of cognitive-behavioral and ACT Constructs in the prediction of health anxiety

Anxiety is a natural response to the perception of threat. It is a multidimensional construct that includes beliefs about threat, physiological reactions in response to threat, and behaviors performed to escape said threat. Generally, anxiety is a safe, evolutionarily adaptive response, but it may cause impairment and distress in certain situations (i.e., at high levels). Given that many people hold their health in high regard, it is no surprise that one's personal health is a common focus of anxiety when one perceives that their health is at risk. Health anxiety (HA) refers to the anxiety that individuals experience due to concerns about their physical wellbeing (Abramowitz & Braddock, 2011).

Symptoms of HA exist along a continuum of severity. Mild levels of HA can be constructive, as such concerns may motivate people to pay attention to their bodily functions and seek appropriate medical interventions in a timely fashion. High levels of HA, or clinically significant HA, however, represent a serious condition that may cause frequent and debilitating distress. Research suggests that the prevalence of HA ranges from 2.1% to 13.1% in the general population and from 4.5% to 30.6% in general medical samples (Weck, Richtberg, & Neng, 2014). Clinically-significant HA is a common feature in many anxiety-related disorders such as illness anxiety disorder (IAD), somatic symptom disorder (SSD), obsessive-compulsive disorder (OCD), panic disorder (PD), and generalized anxiety disorder (GAD).

Symptoms of clinical HA include debilitating distress due to fears about poor health outcomes (e.g., frequent headaches can be interpreted as signs of terminal brain cancer) that often result in the affected individual partaking in safety-seeking behaviors (e.g., visiting doctors to obtain reassurance about good health) in an effort to reduce this distress. These "safety

behaviors" (i.e., stress-reduction strategies) tend to manifest in one of two ways: (1) behaviors aimed at seeking knowledge and reassurance concerning one's health, and (2) behaviors aimed at avoiding information that might indicate that one has a serious medical condition or sources of potential illness. The former manifestation of behaviors often include excessively researching perceived symptoms online, excessively checking the body and its by-products for signs of illness, and constantly seeking reassurance from loved ones that they are not ill. Individuals who employ this distress-reduction strategy may experience financial difficulties due to the cost of repeated visits to health care providers and strained relationships with loved ones as a result of frequently asking them for reassurance. In contrast, the latter manifestation of behaviors often includes avoiding healthcare providers, abstaining from checking one's body for symptoms of illness, and avoiding illness-related cues. Individuals who respond to HA in this manner avoid information that may confirm their fears that they are ill or stimuli they believe are likely to cause them to become ill. Apart from the unique consequences associated with either of the aforementioned distress-reduction strategies, clinical HA is generally burdensome for both the individual experiencing it (i.e., time-consuming, distressing), as well as medical professionals and the health care system as a whole (i.e., costs of unnecessary testing and extraneous appointments).

Among studies of HA symptoms utilizing DSM-IV-TR diagnoses, HA was often associated with hypochondriasis, characterized as a preoccupation with fears of having, or the idea that one has, a serious medical condition despite appropriate medical evaluation and reassurance (APA, 2000). Yet hypochondriasis only overlaps with clinical HA, and HA is generally thought of as a more broadly defined construct ranging from mild to severe (Bleichhardt & Hiller, 2007). Therefore, few studies have been conducted examining HA

independently of hypochondriasis or related conditions, and those that do examine HA independently of hypochondriasis tend to employ heterogeneous definitions of HA (i.e., varying cutoffs for defining when an individual qualifies for having HA). Due to the lack of studies (and inconsistency in existing studies) concerning HA symptoms independent of hypochondriasis, additional research is necessary. Specifically, it is useful to consider various models that help to explain the development and maintenance of HA symptoms across a continuum of severity.

Cognitive-Behavioral Model of Health Anxiety

The cognitive-behavioral model is an empirically supported and widely accepted conceptual approach to understanding HA. According to this model, dysfunctional health-related beliefs that one is ill or at risk for becoming ill (e.g., *"I have a brain tumor"*) are the central feature of clinical HA (Warwick & Salkovskis, 1990; Abramowitz, Schwartz, & Whiteside, 2002; Abramowitz, Deacon, & Valentiner, 2007). These dysfunctional beliefs lead one to become concerned with the possibility of being ill and become hypervigilant of their own bodily functions for signs of illness. Whenever such bodily sensations are detected, one's dysfunctional beliefs contribute to misinterpretations of benign bodily sensations as indications that one has a serious illness. Sensations that are often misinterpreted in cases of clinical HA include normal bodily functions (e.g. heartbeat, sweating), minor physical abnormalities (e.g. an occasional cough, headache), or vague and ambiguous physical feelings (e.g. dizziness, skin discoloration) (Abramowitz, Deacon, & Valentiner, 2007). This misinterpretation of sensations as indicators of illness then triggers catastrophic cognitions that one has a serious illness (e.g. *"My headache is a sign that I have a brain tumor"*). In turn, such catastrophic cognitions contribute to the experience of health-related anxiety and distress (e.g. *"I have a brain tumor, I am going to die!"*). In order to alleviate this distress, one performs safety-seeking behaviors (e.g. frequently

seeking reassurance from medical professionals that no brain tumor is present). The implementation of safety behaviors temporarily reduces one's distress by alleviating the immediate anxiety caused by their catastrophic cognitions. However, such behaviors also maintain HA over time by preventing the affected individual from gaining evidence that disconfirms their dysfunctional belief, which is the cause of their distress in the first place.

There are several cognitive errors or biases associated with the maintenance of HA. These cognitive maintenance factors include an attention bias toward possibly threatening cues, a confirmation bias toward information that validates one's dysfunctional beliefs that they are ill, and an intolerance toward uncertainty (Warwick & Salkovskis, 1990; Abramowitz, Schwartz, & Whiteside, 2002). In cases of clinical HA, the threatening stimuli are often benign bodily sensations and perturbations. Those with clinical HA have been shown to be highly body vigilant toward these cues. In addition to attending to threatening cues, those with clinical HA have demonstrated a confirmation bias toward information that validates their dysfunctional beliefs. For instance, a patient with clinical HA may misinterpret a physician's suggestion for additional examinations as evidence supporting their belief that they are ill. In contrast, such patients also tend to discount information that contradicts their beliefs and readily seek opinions from several doctors when seeking reassurance that they are not ill. Lastly, those with clinical HA have been shown to demonstrate a heightened intolerance toward uncertainty concerning their beliefs about their health. In other words, those with clinical HA become particularly distressed when they cannot obtain absolute certainty that they are healthy. This bias plays a role in exacerbating the anxiety and distress in response to catastrophic thoughts about illness and informing dysfunctional health-related beliefs.

Anxious individuals also exhibit a tendency to overestimate the likelihood and severity of an impending illness. For example, an individual who is concerned about their headaches may believe with conviction that they are very likely ("nearly certain" or "95% sure") to be ill, when, in reality, their likelihood of being seriously ill is quite slim (i.e., <.01%). Relatedly, anxious individuals may overestimate "how bad" the consequences of their illness might be. For example, they might make a logical jump from thinking that their headaches could be related to dehydration (a benign scenario) to believing that their headaches are related to a brain tumor (the worst possible scenario). In sum, the cognitive behavioral model suggests that cognitions about one's health play a central role in the development and maintenance of HA.

Relational Frame Theory

Although the cognitive-behavioral model of HA has been shown to have strong empirical support, it does not completely explain all of the variability in HA symptoms (Abramowitz & Braddock, 2008). Therefore, it is important to consider other factors that may help to explain variability in symptoms of HA. Relational Frame Theory (RFT), which forms the basis of Acceptance and Commitment Therapy (ACT), is of interest given its explanatory power in understanding models of anxiety (Roemer & Orsillo, 2002). RFT is a psychological theory of human language, which posits that language and cognition are derived from our ability to form relationships between events under arbitrary contextual control (Hayes, 2004). According to RFT, humans assign meaning to events in two ways: (a) through direct experience of their properties, and (b) by forming relationships between other events that they have experienced with similar properties and in similar contexts. Whenever one assigns meaning to an event, they in turn form a "relational frame" of that event, conceptually connecting it to other events they have related to it. These relational frames affect how one experiences and responds to stimuli by

likening specific stimuli to other stimuli that they have experienced with similar properties and under similar contexts (Hayes, 2004).

What makes humans' ability to form relational frames clinically relevant is that functions assigned to one member of related events tend to alter the functions of other members (Hayes, 2004). For instance, if a child is bitten while playing with a German Shepherd, that child then forms an association between German Shepherds and being bitten. Ultimately, due to this association, the child develops a phobia of dogs. According to RFT, this child has assigned a function (a fear of being bitten) to an event (being around the specific German Shepherd that attacked them), and, as a result, this function has also been associated with other related events such as being around dogs in general.

RFT posits that humans develop psychopathology as a result of associating unpleasant internal experiences (e.g. thoughts, feelings, sensations etc.) with an event and then involuntarily associating such experiences with other related events. In the case of HA, for example, a person may develop a mole that turns out to be Stage 1 skin cancer. They have the mole removed and are unharmed; however, due to this experience they have formed an association between discovering that specific mole and the distressing thought "*I have cancer.*" After this experience, this person becomes preoccupied with any new mole that they discover, thinking it might be cancerous. They constantly check their body for new moles and go to the dermatologist anytime they discover a mole to make sure they do not have cancer. Here, they have related an initial association between discovering that they have one specific mole and the thought that they have cancer to all other moles which they may discover. In extreme cases, they may begin to associate discovering other physical abnormalities (sores, bumps, coughs, etc.) with the thought that they have cancer.

It is evident that all people do not develop an anxiety disorder as a result of experiencing a traumatic event (e.g., discovering that they have cancer). RFT accounts for this fact by claiming that people develop psychopathology as a result of decreased psychological flexibility. Psychological flexibility is defined as one's willingness to be in the present moment as a conscious human being, and regardless of the situation, act according to their own values (Bond, Hayes, Strosahl, Barnes, & Holmes, 2006). In other words, those who are psychologically flexible do not dwell on their own internal experiences. According to RFT, those who demonstrate low levels of psychological flexibility are at risk for developing psychopathology due to a tendency to be preoccupied by their own internal events and react negatively to adverse situations, even if doing so impairs their ability to function. Two constructs associated with ACT, derived from RFT, are thought to be predictive of the development of psychopathology: experiential avoidance (EA) and cognitive fusion. Both of these constructs are thought to play a role in the etiology and maintenance of anxiety disorders and are related to various manifestations of anxiety (e.g. Tull, Gratz, Salers, & Roemer, 2004; Abramowitz, Lackey, & Wheaton, 2009; Reuman, Jacoby, & Abramowitz, 2016).

Experiential avoidance (EA), also referred to as psychological inflexibility, is defined as the tendency to avoid unpleasant internal experiences, even when doing so interferes with one's values (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Those who exhibit high levels of EA go to great lengths to alter the form and frequency of their unpleasant internal experiences and the contexts in which they arise. In the case of clinical HA, one with high levels of EA would attempt to control or resist distressing health-related internal experiences (Wheaton, Berman, & Abramowitz, 2010). In order to accomplish this, individuals partake in behaviors aimed at avoiding such experiences, even if doing so affects them negatively. In the example of an

individual with a fear of developing skin cancer, EA is exhibited through their unwillingness to experience the anxiety associated with the thought that they have cancer. As a result, they frequently resist (rather than accept) this emotional thought and engage in various behaviors to try and change the thought such as visit the dermatologist in order to receive reassurance, even if doing so comes at a great expense (i.e., time or money).

Cognitive fusion refers to the tendency to take thoughts literally rather than view them as random mental events. When one is fused to their thoughts, they behave as though their thoughts are literally true (Gillanders et al., 2014). In the context of HA, individuals with high cognitive fusion may conflate their *thought* that they have or are at risk for developing a serious illness with the *fact* that they actually have such an illness. In the earlier example of a person who has a fear of developing skin cancer, cognitive fusion is exhibited through their conflation of their thought that they have cancer with the fact that they actually have cancer. As a result, this person may therefore act accordingly by seeking medical consultation.

Prior Research

Measures related to the previously mentioned theoretical perspectives (i.e., CBT and RFT/ACT) have been developed to assess the constructs of interest (i.e., health-related cognitions, EA, and cognitive fusion). For the cognitive-behavioral model, the Health Cognitions Questionnaire (HCQ) assesses the prevalence of various dysfunctional health-related beliefs that are typically present in HA (Hadjistavropoulos, Kehler, Sharpe, & Bourgault-Fagnou, 2012). For the RFT/ACT model, the Acceptance and Action Questionnaire II (AAQ-II) and Cognitive Fusion Questionnaire (CFQ) have been developed in order to assess EA and cognitive fusion respectively (Bond et al., 2011; Gillanders et al., 2014).

Research has shown that dysfunctional health-related beliefs account for variability in HA symptoms (Hadjistavropoulos, Craig, & Hadjistavropoulos, 1998). Further, research using the HCQ and AAQ-II have demonstrated that health-related beliefs and EA are predictive of HA symptoms (Wheaton, Berman, & Abramowitz, 2010; Hadjistavropoulos et al. 2012). No previous research has investigated the role of cognitive fusion in HA. Yet, empirical evidence suggests that cognitive fusion is relevant in explaining related symptoms of anxiety such as obsessive-compulsive symptoms (Reuman, Buchholz, Blakey, & Abramowitz, 2017). Further, little research has examined the joint role of EA and cognitive fusion in predicting HA symptoms. Also, no research to date has directly compared RFT/ACT constructs with CBT constructs in the context of HA.

The Present Study

Given the lack of previous research in examining the role of RFT/ACT constructs in explaining HA, the current study aims to examine how EA and cognitive fusion predict symptoms of HA. Furthermore, the current study will explore whether or not the RFT/ACT constructs of interest jointly, or individually, contribute to predicting HA above and beyond cognitive-behavioral constructs (e.g., dysfunctional health-related beliefs). Because EA focuses on the resistance of one's own internal experiences (e.g., emotions such as anxiety) and cognitive fusion relates to ascribing meaning to internal experiences (e.g., thoughts in response to experiencing ambiguous bodily sensations and perturbations), we hypothesize that these RFT/ACT constructs will explain variability in HA symptoms above and beyond cognitive-behavioral models. Understanding the psychological factors that predict HA is important because knowledge of these factors can help inform assessment, treatment, and prevention strategies for HA.

Method

Participants

Three-hundred and thirty-three undergraduates enrolled in introductory psychology courses at a large university in the southeastern United States participated in the study in exchange for course credit. Data were collected via an online survey. Although 333 participants initially completed the survey, 68 individuals were excluded from analysis as a result of either failing an attention check (*n*=15) or indicating a diagnosed medical condition (e.g. thyroid condition) (*n*=53). Of the 265 eligible submissions, 196 participants (74.0%) were female, 68 participants (25.7%) were male, and one person did not identify as male or female. Participants' ages ranged from 17 to 41 years old with a mean age of 18.55 years old (*SD* = 2.09 years). The sample consisted of 155 (58.5%) first-years, 70 (26.4%) second-years, 26 (9.8%) third-years, 13 (4.9%) fourth-years, and one person who did not indicate their class year. Furthermore, 182 (68.7%) of the participants identified as White, 39 (14.7%) identified as Asian American, 18 (6.8%) identified as African American, 1 (0.4%) identified as Native American, and 16 (6.0%) identified as "Other." With regard to ethnicity, 34 participants (12.8%) identified as being of Hispanic or Latino descent.

Measures

Participants completed the following self-report questionnaires as part of this study.

The **Short Health Anxiety Inventory** (SHAI; Salkovskis et al., 2002). The SHAI is an 18-item measure that assesses HA independently of physical health status. Items measure concern about health, one's awareness of bodily changes or sensations, and feared consequences of being ill via a multiple-choice format. Response options range from 0 to 3 options. The SHAI has exhibited good reliability and validity in clinical and non-clinical samples (Salkovskis et al.,

2002; Abramowitz, Deacon, & Valentiner, 2007). Internal consistency of the SHAI in the present sample was good (α = .87).

The **Health Cognitions Questionnaire** (HCQ; Hadjistavropoulos et al. 2012). The HCQ is a 20-item measure that assesses the prevalence of cognitions involved in the cause and maintenance of HA. The HCQ contains four subscales measuring core beliefs associated with health anxiety: (1) the likelihood of becoming ill, (2) potential awfulness of illness, (3) one's ability to cope with being ill, and (4) the availability and adequacy of medical services. Items (e.g. "*I feel like I am likely to experience health problems"*) are rated on a scale from 1 ("*Strongly Disagree*") to 5 ("*Strongly Agree*"). This study utilized the "No Health Condition Version" of the HCQ, which specifically measures the degree to which participants experience cognitions that are involved in the cause and maintenance of HA in a sample of individuals without an identified serious health condition. Therefore, participants who identified as having such a health condition were excluded prior to data analyses. The HCQ has exhibited good internal consistency and predictive and discriminant validity in previous studies (Hadjistavropoulos et al. 2012). Internal consistency of the HCQ subscales in the present sample ranged from acceptable to good (αs= .78-.88).

The **Acceptance and Action Questionnaire II** (AAQ-II; Bond et al., 2011). The AAQ-II is a seven-item measure that assesses the relational frame construct of EA. Items (e.g. "*I'm afraid of my feelings*") are rated on a scale from 1 ("*Never true*") to 7 ("*Always true*"), where higher scores indicate greater psychological flexibility (less pathology). The AAQ-II has demonstrated appropriate discriminant validity (Bond et al., 2011). Internal consistency of the AAQ-II in the present sample was good (α = .86).

The **Cognitive Fusion Questionnaire** (CFQ; Gillanders et al., 2014). The CFQ is a seven-item measure that assesses the RFT construct cognitive fusion. Items (e.g. "*I tend to react very strongly to my thoughts*") are rated on a scale from 1 (*"Never true*") to 7 ("*Always true*"), where higher scores indicate a greater degree of cognitive fusion. The CFQ has exhibited excellent internal consistency and the ability to distinguish between healthy individuals and those with psychological disorders (Gillanders et al., 2014). Internal consistency of the CFQ in the present sample was excellent (α = .92).

The **Depression Anxiety and Stress Scale** (DASS-21; Lovibond & Lovibond, 1995). The DASS-21 is a 21-item measure that assesses general distress over the course of the past week. The DASS-21 contains three seven-item subscales measuring depression, anxiety, and stress respectively. Items (e.g. "*I felt like I was close to panic)* are rated on a scale from 1 ("*Did not apply to me at all*") to 4 ("*Applied to me very much, or most of the time*"). Each of the subscales of the DASS- 21 has demonstrated acceptable to excellent internal consistency concurrent validity in both clinical and non-clinical samples (Antony, Bieling, Cox., Enns, & Swinson, 1998). Internal consistency of the DASS-21 subscales in the present sample ranged from acceptable to good (αs= .76-.88).

Procedure

All measures and procedures implemented in this study were approved by the University's Institutional Review Board. Participants voluntarily registered to take part in this study online via SONA, the university's undergraduate psychology research pool. After registering, participants were given a link, which redirected them to a survey that was administered through Qualtrics, a secure platform.

Upon beginning the survey, participants were presented with a consent form and given the option to provide their consent or not. If consent was not given, the survey automatically ended, and participants did not receive participation credit. Otherwise, the aforementioned self-report questionnaires were administered in a counterbalanced order using Qualtrics' randomization feature. One attention check, which asked the participant to rate what degree they agree with the statement "I frequently suffer from fatal heart attacks," was embedded in the survey. If a participant answered affirmatively to this statement, they were excluded from the data analysis. This item was added as a precaution to ensure that the participant was paying attention and fully understood the items before answering them. After completing the study measures, participants were presented with a demographic questionnaire inquiring about their gender, age, race, and medical history. The demographic questionnaire was administered at the end of the survey in order to ensure that the questions did not influence the participants' responses on other study materials. All responses were automatically recorded by Qualtrics.

After completing the survey, participants were thanked for their participation in the study and presented with a debriefing page, which provided details regarding the purpose of the study. After being debriefed, participants were awarded thirty-minutes of credit (0.5 units) towards a research participation requirement for their introductory psychology class. Participants who skipped questions or prematurely ended the survey were still awarded SONA credit. Once all data was collected, statistical analyses were conducted using SPSS version 24.

Date Analysis

The data collected was analyzed using the following steps. First, descriptive statistics were calculated for all study variables to help characterize the sample. Second, a series of two-tailed zero order correlations were computed in order to examine associations and

multicollinearity between study measures. Lastly, to examine the extent that EA and cognitive fusion contribute as predictors to HA symptoms after controlling for general distress and dysfunctional health-related beliefs, a hierarchical regression analysis was run by entering measures of general distress (i.e., DASS-21) in step 1, measures of dysfunctional health-related cognitions (i.e., HCQ subscales) in step 2, and measures of RFT/ACT constructs (CFQ and AAQ-II) jointly in step 3.

Results

Group Mean Scores

Table 1 presents the means and standard deviations for all study measures. As would be expected in our undergraduate sample, the group showed generally mild levels of HA symptoms. Mean levels of EA, cognitive fusion, and scores on the HCQ subscales fell within the nonclinical range. (Lovibond & Lovibond, 1995; Salkovskis et al., 2002; Bond et al., 2011; Hadjistavropoulos et al. 2012; Gillanders et al., 2014)

Correlations

Two-tailed zero-order correlations between study measures were conducted using Bonferroni adjusted alpha levels of .001 per test (.05/45). Correlations between the study measures are displayed in Table 2. The SHAI was significantly, negatively associated with all three DASS subscales (*r*s ranged from .45 to .53, *p*s < .001), indicating that increased HA symptoms were associated with greater endorsement of depression, anxiety, and stress symptoms. The SHAI was also significantly, positively associated with all four HCQ subscales (*r*s ranged from .17 to .42, *p*s < .01), indicating that increased HA symptoms were also moderately associated with greater endorsement of health conscious cognitions (HCQ subscales).

The Pearson correlation between the CFQ and AAQ-II indicated considerable, yet not complete, overlap between the two measures, r (265) = .76, p < .001. Accordingly, we proceeded with our analyses and regarded the AAQ-II and CFQ as measures of distinct constructs. We also note that higher scores on the CFQ indicate more cognitive fusion and higher scores on the AAQ-II indicate greater psychological inflexibility. Since both constructs are negative predictors we expected that measures of HA symptoms (SHAI) would be positively associated with both the AAQ-II and CFQ. Indeed, the SHAI was positively associated with both the CFQ (r = .45) and the AAQ-II (r =.49).

Regression Analyses Predicting HA Symptoms

Prior to running regression analyses, we assessed whether the assumptions for linear regression were met. Specifically, we examined normality, homoscedasticity, and linearity of the relationships between variables and the outcome. Given that the DASS-Depression and DASS-Anxiety scores were positively skewed, and leptokurtic, DASS-Depression and DASS-Anxiety scores were log-transformed, the log-transformed scores were used in subsequent analyses. Given that all assumptions were met following this transformation, we preceded with linear regression analyses (Table 3).

Cognitive fusion, EA, HA cognitions, and general distress as predictors.

In Step 1 of the model, the DASS-21 subscales explained significant variance in SHAI scores (R^2 = .29, p < .01). As can be seen in Table 3, only the DASS-Anxiety subscale emerged as a significant individual predictor. The addition of the HCQ subscales in Step 2 explained significant additional variance (R^2 change = .12, p <.001), with beliefs about coping, the adequacy of medical services and the likelihood of becoming ill emerging as significant individual predictors. The addition of the RFT/ACT constructs in Step 3 explained significant

additional variance (R^2 change = .02, p = .02); however, neither EA nor cognitive fusion emerged as significant unique predictors. The final model accounted for 41.9% of the variance in SHAI scores, $F(9,264) = 22.18$, $p < .001$ (See Table 3 for a description of the hierarchical regression).

Discussion

The cognitive-behavioral model proposes that HA develops and is maintained as a result of dysfunctional health-related beliefs that cause one to misinterpret their benign bodily sensations as indicators of serious illness. Prior research has demonstrated that such dysfunctional health-related beliefs are strongly implicated in predicting symptoms of HA (Hadjistavropoulos, Craig, & Hadjistavropoulos, 1998). Yet, research suggests that the cognitive-behavioral model of HA does not entirely account for the variability in HA symptoms (Abramowitz & Braddock, 2008). As such, it is worthwhile to consider other theoretical approaches to conceptualizing HA. RFT/ACT is one perspective of interest due to its explanatory power for understanding related models of anxiety (Roemer & Orsillo, 2002). RFT/ACT posits that EA and cognitive fusion play a role in the etiology and maintenance of psychopathology including anxiety disorders, and, in turn, HA. This seems plausible considering that both EA and cognitive fusion concern how an individual relates to their internal experiences (i.e., emotions and thoughts) such as anxiety and distressing health-related worries. Previous research has revealed support for EA as a predictor of HA symptoms (Wheaton, Berman, & Abramowitz, 2010). No previous research, however, has examined cognitive fusion as a predictor of HA. Accordingly, the current study was the first to investigate EA, cognitive fusion, and dysfunctional health-related beliefs as independent and relative predictors of HA symptomology.

In line with previous research (e.g., Hadjistavropoulos, 2012), findings from the current study revealed that dysfunctional health-related beliefs were moderately positively associated with HA. These findings were consistent with the cognitive-behavioral model and our hypotheses. Although all HCQ subscales were associated with HA, the three subscales measuring beliefs concerning the likelihood of illness, one's ability to cope with illness, and the inadequacy of medical services were most strongly correlated with HA. The HCQ subscale assessing beliefs about the awfulness of illness was less strongly correlated with HA symptoms in the current non-clinical sample. This makes sense, as HA tends to be defined as anxiety experienced due to concerns that one has a serious illness or that one is likely to become seriously ill. Based on this definition, these findings are consistent with the hypothesis that beliefs concerning the likelihood of illness and the likelihood that one is to recover from illness (whether it be as a result of their own ability to cope or the available medical services) play a major role in the cause of HA. Our correlational findings, however, are inconsistent with the view that beliefs concerning the awfulness of illness are involved with the development of HA. One possible explanation for this finding is that individuals in our college student sample are most likely healthy and may consider merely the probability, rather than the severity, of having an illness.

HA symptoms were strongly associated with EA and cognitive fusion. These findings are consistent with prior research demonstrating that EA is associated with HA (Wheaton, Berman, & Abramowitz, 2010). More broadly, this finding is in line with the hypothesis that anxiety disorders are associated with lower levels of psychological flexibility. Additionally, findings from the current study revealed that cognitive fusion and EA were strongly correlated with one another. These results were in accordance with previous research (Gillanders et al., 2014;

Reuman, Jacoby, & Abramowitz, 2016) and were in line with hypotheses (as EA and cognitive fusion are both related to psychological flexibility, and both concern one's relation to their internal experiences). Additionally, the measure used to assess EA (AAQ-II) contains a slight overlap with items assessing cognitive fusion, potentially contributing to the strong correlation between both constructs.

In order to test our hypothesis that RFT/ACT constructs significantly contributed to explaining variability in HA symptoms above and beyond cognitive-behavioral constructs and general distress, we ran a hierarchical regression analysis. This analysis was conducted in three steps. First, we entered the DASS-21 to account for general distress. Second, the HCQ was entered to account for the role of dysfunctional health-related beliefs. Third, the AAQ-II and CFQ were jointly entered to see if RFT constructs accounted for variability in HA symptoms.

The results of the first step showed general distress as a significant predictor for HA. Of the three DASS subscales, the anxiety subscale was the only unique predictor of HA. This is in line with previous findings that demonstrate high levels of overlap/comorbidity among anxiety diagnoses given the similar processes at play. Similarly, the results of the second step showed that select dysfunctional health-related cognitions were a significant predictor of HA. Of the four HCQ subscales included, the subscales that measured beliefs concerning the likelihood of illness and one's ability to cope with illness were found to be unique predictors for HA symptoms. This supports existing cognitive models of HA, which suggest that overestimates about the likelihood of becoming ill are common in HA. The HCQ subscale measuring awfulness of illness was not predictive of HA, in accordance with the possibility that such thoughts are not held as often by generally healthy young adults as in other populations.

The results of the final step of the regression analysis supported our hypothesis that RFT/ACT constructs significantly contributed to explaining variability in HA symptoms above and beyond cognitive-behavioral constructs and general distress. This suggests that RFT may offer additional explanatory power in helping to understand symptoms of HA. Although dysfunctional cognitions play a large role in explaining symptoms of HA, our results reveal that the extent to which one is fused to or resists said beliefs is also important in understanding the development and maintenance of HA symptoms. Although EA and cognitive fusion jointly predicted significant variance, neither construct did so independently. This may be due to the fact that these constructs are strongly related to one another. Although our findings are correlational, they are consistent with the possibility that EA and cognitive fusion play a role in the development of HA as they both involve how one relates to their internal experiences. In the case of EA, we speculate that one's unwillingness to experience unpleasant health-related cognitions may promote the conduction of safety behaviors that are characteristic of clinical HA. In the case of cognitive fusion, we speculate the tendency to interpret one's thoughts literally might result in one viewing their unpleasant health-related beliefs as facts, thus contributing to their health-related distress.

Although there were several strengths of the study (i.e., using psychometrically sound measures with a large sample), this study was subject to various limitations. First, the data were collected from a non-treatment seeking student sample. This may limit the generalizability of the study, as it is unclear whether these patterns would hold true for individuals with clinically significant HA or individuals of varying ages. Second, the cross-sectional design and correlational nature of this study prevents any conclusions concerning causality and directionality from being made. Third, data were solely collected via self-report measures and

therefore may have been subject to overinflated associations between measures or response biases. Such biases include (a) the acquaintance bias, characterized by the tendency to respond affirmatively to self-report measures when in doubt; (b) extreme responding, which is defined as the tendency to respond in accordance with the most extreme options of survey items; (c) demand characteristics, defined as the tendency for participants to alter their responses due to their beliefs about the purpose of the study; and (d) social desirability, which is characterized by the tendency to respond to self-report measures in a way that they perceive as socially desirable. All of these biases influence the validity of self-report measures and may potentially influence the results. Additionally, individuals with chronic health conditions were excluded from the study. This limits the generalizability of the results to those who experience HA in the absence of a serious physical illness.

Future research should address the limitations of this study by analyzing the contributions of EA, cognitive fusion, and dysfunctional health-related beliefs in clinical samples using a longitudinal design and including multimethod assessment (e.g., behavioral tasks and/or clinical interviews). Further, future research should include samples that demonstrate greater variability of HA symptoms to see whether certain constructs predict HA symptoms differently at varying levels of symptomatology. The use of a longitudinal design would allow researchers to observe the interactions between RFT/ACT-derived constructs and HA symptoms over time with the potential to make causal inferences. The inclusion of multimethod assessment might decrease the potential effect of response biases, therefore improving a researcher's ability to accurately measure relevant constructs. In order to improve our understanding of HA, it is also worthwhile to examine the relationship between other RFT/ACT-derived constructs (e.g., self as context, values) as well as the relationship between RFT/ACT constructs and other anxiety-related

disorders. Additionally, researchers have argued that RFT/ACT constructs such as EA and cognitive fusion are too broad (Chawla & Ostafin, 2007). Future research should develop disorder-specific measures (e.g., an HA-specific AAQ-II) to examine the role of RFT/ACT constructs in the cause and maintenance of specific psychopathologies. Such measures may be better suited than those used in this study for examining the relative contributions of EA and cognitive fusion in understanding specific disorders.

In sum, the findings of this study demonstrate that RFT/ACT constructs (i.e., EA and cognitive fusion) contribute to explaining variance in HA symptoms above and beyond cognitive-behavioral constructs (e.g., dysfunctional cognitions); however, no single RFT/ACT construct emerged as a significant, unique predictor. As such, it is worthwhile to consider integrating such concepts into current empirically-supported models of HA. Furthermore, findings suggest that clinicians should not only target cognitions pertaining to an individual's health, but also consider addressing EA (i.e., psychological inflexibility) and cognitive fusion by promoting psychological flexibility, defusion, and acceptance-based ACT strategies in the treatment of clinical HA.

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Table 1.

Descriptive Statistics for Study Measures

Measure	*Mean*	*SD*
SHAI	13.22	6.63
DASS-Total	23.53	18.25
DASS - Depression	6.64	7.14
DASS - Anxiety	6.01	6.26
DASS- Stress	10.88	7.44
HCQ-Coping	21.64	5.52
HCQ-Medical Services	9.83	2.84
HCQ-Likelihood	10.80	3.34
HCQ-Awfulness	15.22	2.88
CFQ	24.79	8.48
AAQ-II	20.17	8.07

Note. SHAI = Short Health Anxiety Inventory; DASS = Depression Anxiety and Stress Scales-21; HCQ = Health Cognitions Questionnaire; CFQ = Cognitive Fusion Questionnaire; AAQ-II = Acceptance and Action Questionnaire.

Table 2.

Correlations between study Measures

	1	2	3	4	5	6	7	8	9
1. SHAI	--								
2. DASS-Depression	.45**	--							
3. DASS-Anxiety	.53**	.65**	--						
4. DASS-Stress	.47**	.60**	.70**	--					
5. HCQ-Coping	.39**	.35**	.30**	.28**	--				
6. HCQ-Medical Services	.36**	.23**	.25**	.18*	.35**	--			
7. HCQ-Likelihood	.42**	.39**	.33**	.33**	.12	.24**	--		
8. HCQ-Awfulness	.17*	.13*	.12	.17*	.32**	-.05	.03	--	
9. CFQ	.45**	.51**	.56**	.59**	.29**	.13	.30**	.25**	--
10. AAQ-II	.49**	.65**	.65**	.66**	.36**	.22**	.35**	.21*	.76**

Note. SHAI = Short Health Anxiety Inventory; DASS = Depression Anxiety and Stress Scales-21; HCQ = Health Cognitions Questionnaire; CFQ = Cognitive Fusion Questionnaire; AAQ-II = Acceptance and Action Questionnaire.

*$p<.01$
** $p < .001$

Table 3.

Summary of regression statistics for the prediction of HA symptoms (SHAI)

	β	*t*	*p*	sr^2
Step 1: DASS				
Depression	-.06	-.91	.36	.00
Anxiety	.19	2.84	.01	.01
Stress	.10	1.44	.15	.00
Step 2: HCQ Subscales				
Coping	.16	2.84	<.001	.02
Medical Services	.15	2.73	.01	.02
Likelihood	.22	4.18	<.001	.04
Awfulness	.04	.71	.48	.00
Step 3: RFT/ACT Measures				
CFQ	.09	1.25	.21	.00
AAQ-II	-.13	-1.68	.09	.01

Note. DASS = Depression Anxiety and Stress Scales-21; HCQ = Health Cognitions Questionnaire; RFT = Relational Frame Theory; ACT = Acceptance and Commitment Therapy; CFQ = Cognitive Fusion Questionnaire; AAQ-II = Acceptance and Action Questionnaire.